REMARKS

INTRODUCTION:

In accordance with the foregoing, a new abstract is enclosed. Claims 1, 5, 15, 16, 20 and 25 were amended; no new matter was added. Claims 1-29 are pending and under consideration. No new matter is being presented, and reconsideration and approval of claims 1-29 are respectfully requested.

AMENDMENT TO ABSTRACT:

The abstract was amended to replace the terminology "comprises" with ---includes---. Thus, the abstract is now deemed to be in allowable form.

AMENDMENTS TO THE SPECIFICATION:

Paragraph 20, page 5 was amended for clarity to change "natural rubber such as NBR-Acrylic-Nitric Butadiene rubber" to ---rubber such as NBR-Acrylonitrile Butadiene Rubber--- to correct the typographical error insertion of "natural" and since "Acrylic-Nitric Butadiene" may also commonly be denoted "Acrylonitrile Butadiene."

Line 4 of paragraph 33, page 7, of the specification was amended to change "natural rubber" to ---natural rubber or rubber--- because both types of rubber are intended (see claim 26).

Lines 8-9 of paragraph 33 were amended to change "the natural rubber is NBR-Acrylic-Nitric Butadiene rubber" to ---the rubber is NBR-Acrylonitrile Butadiene Rubber)--- to correct the typographical error insertion of "natural" and since "Acrylic-Nitric Butadiene" may also commonly be denoted "Acrylonitrile Butadiene."

No new mater is added.

AMENDMENTS TO CLAIMS:

Claims 1, 15 and 20 were amended to delete the term "natural" in correspondence with claim 26.

Claims 5, 16 and 25 were amended to change "natural rubber (NBR-Acrylic-Nitric Butadiene rubber" to ---rubber (NBR-Acrylonitrile Butadiene Rubber)--- to correct the

typographical error insertion of "natural" and since "Acrylic-Nitric Butadiene" may also commonly be denoted "Acrylonitrile Butadiene."

No new matter is added.

REJECTION UNDER 35 U.S.C. §112:

At page 2 of the Office Action, claims 1-29 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. This rejection is respectfully traversed.

The Examiner states the phrase "polymer-type" in a preamble portion of claims 1-29 renders the claims 1-29 indefinite because "the claims include elements not actually disclosed (those encompassed by "polymer-type"), thereby rendering the scope of the claims unascertainable."

Applicants respectfully point out that the preamble of claims 1-29 recites, in part, a type of a humidity sensor, that is, a polymer-type humidity sensor as opposed to, for example, a ceramic-type humidity sensor. Applicants have amended claims 1, 5, 15, 20 and 25 to change "natural rubber" to ---rubber---. Since the remaining claims depend from amended claims 1, 15, 20 and 26 (which already reads "rubber"), the remaining claims are deemed to be in allowable form. Accordingly, it is respectfully submitted that claims 1-29 are in allowable form under 35 U.S.C. §112, second paragraph.

REJECTION UNDER 35 U.S.C. §102:

At pages 3 and 4 of the Office Action, claims 1-4, 15 and 26 were rejected under 35 U.S.C. §102(b) as being anticipated by Wakabayashi et al. (US 3,848,218). This rejection is respectfully traversed.

Wakabayashi et al. appears to disclose a thin film composite humidity sensor 10 having a substrate 2, a humidity sensitive film 1, and a pair of electrodes 3 and 4. (See FIGS. 1 and 2). In particular, Wakabayashi et al. appears to disclose a humidity sensitive thin film ("humidity sensitive film") that is a reaction by-product of a chlorine containing polymer, for example, a chlorinated natural rubber, and a polyamide resin having a carbon. (See column 4, lines 56-61, column 2, lines 45-48 and 63-65, and column 3, lines 23-25).

That is, Wakabayashi et al. discloses that several complicated process s are utilized to obtain a mixture of a chlorinated rubber and a polyamide resin having a carbon, in a paintable thin film form. This mixture is further treated in an alkali solution because the untreated mixture

has a bad effect on DC operation of the thin film humidity sensor. (Se column 3, line 62 to column 4, line 56). In fact, Wakabayashi et al. expressly states that "the final product has a very complicated structure and cannot be clearly analyzed, so that it [that is, a reaction product of a chlorine containing polymer and a polyimide resin which has been alkali treated] cannot be defined otherwise." (See column 4, lines 56-69).

Once the mixture is prepared, Wakabayashi et al. discloses applying the mixture as the humidity sensitive film 1 on the substrate 2 using a conventional thin film processing method. Wakabayashi et al. discloses that "[i]t is preferred that the thickness of the humidity sensitive film 1 is designed to be between 2 and 5 microns," and while the thickness can be increased, expressly states, "[a]s the thickness of the humidity sensitive film increases,...[it] has...slower response to the changes of humidity." (See column 2, lines 2-10). It appears that to increase the stability of this complicated humidity sensitive film, a cover 7 is necessarily provided to protect the humidity sensitive film 1. (See FIG. 2 and column 5, lines 50-53). Furthermore, it appears that due to the fact the humidity sensing structure of Wakabayashi et al. is in a form of a thin film (between 2 and 5 microns as described above), an additional support structure, that is, the substrate 2, is a necessary element of the thin film humidity sensor 10 of Wakabayashi et al. (See FIGS. 1 and 2).

Accordingly, Applicants respectfully note that Wakabayashi et al. is directed to a thin film humidity sensor 10 having a composite chlorinated rubber and carbon added polyimide resin structure, while an aspect of the present invention is directed to a simple, durable and low-cost polymer-type humidity sensor. That is, Applicants respectfully note that a thin film humidity sensor of Wakabayashi et al. is structurally different from a polymer-type humidity sensor of the present invention, and Wakabayashi et al. does not appear to disclose or suggest a polymer-type humidity sensor comprising "a polymer structure having a natural rubber and carbon," as similarly recited in claims 1, 15, and 26 of Applicants' application.

As supported by the disclosure of Wakabayashi et al., and pointed out in Applicants' application, "thin film type humidity sensors require complicated manufacturing and fabrication processes." (See fabrication processes disclosed in Wakabayashi et al. and paragraph 16 of Applicants' application). Applicants respectfully note that their claimed invention is presented, for example, to solve the above problem, or to produce a simple, durable and low-cost humidity sensor that can replace a thin film type humidity sensor, which is expensive to produce and non-durable. Also, while not disclaiming such a use, an additional support structure, for example, a substrate used in Wakabayashi et al., is not necessary in the present invention to

act as a foundation layer to support the polymer structure, further easing the manufacturability and cost of a polymer-type humidity sensor according to the present invention.

With respect to dependent claims, Applicants respectfully note that the Examiner has again misinterpreted the disclosure of Wakabayashi et al.

For example, Wakabayashi et al. does not disclose or suggest a polymer structure having carbon "in a range of 15-20%±5% volume," (emphasis added) as recited in, for example, claim 2 of Applicants' application. Rather, Wakabayashi et al. discloses a humidity sensitive thin film having a 23-60 weight % carbon.

Additionally, Wakabayashi et al. does not disclose or suggest a polymer-type humidity sensor having a resistance "in a range of 500KΩ – 2MΩ," that is 500KΩ – 2,000,000Ω, (emphasis added) as recited in, for example, claim 3 of Applicants' application. Rather, as shown in table 1 of column 6 cited by the Examiner, a thin film humidity sensor of Wakabayashi et al. has a resistance in a range of 2.7KΩ - 300KΩ. While table 6 column 10 of Wakabayashi et al. shows that a sample 22 may have a resistance of 600KΩ at 100% relative humidity (RH), it appears that this was obtained by coating a polydimethyl siloxan solution as a thin film cover on top of the thin film humidity sensor, and not by the thin film humidity senor acting alone. (See column 9, line 37 to column 10, line 2).

Also, Wakabayashi et al. does not disclose or suggest a polymer-type humidity sensor having "an impedance of $2X10^6\Omega$ and $5X10^5\Omega$," that is, 2MΩ and 500KΩ, "at a relative humidity range of 0% and 100% and undergoes impedance change as a function of relative humidity over the whole relative humidity range," (emphasis added) as recited in, for example, claim 4 of Applicants' application. Rather, as shown in table 1 of column 6, a thin film humidity sensor sample 3 of Wakabayashi et al. has a resistance in a range of 35Ω - 300KΩ at a relative humidity range of 30% and 100%. It appears that a thin film humidity sensor of Wakabayashi et al. doe not cover the relative humidity range of 0% to 29%.

As noted above, Applicants respectfully note that a thin film humidity sensor disclosed in Wakabayashi et al. is structurally different from a polymer-type humidity sensor of the present invention, and Wakabayashi et al. does not appear to teach each and every element of claims 1-4, 15 and 26, as required by MPEP §2131. Accordingly, it is respectfully submitted that since Wakabayashi et al. does not teach the features recited in claims 1-4, 15 and 26, as stated above, withdrawal of the § 102(b) rejections is earnestly solicited.

REJECTION UNDER 35 U.S.C. §103:

At pages 4 through 8 of the Office Action, claims 5-14 and 16-19 were rejected under 35 U.S.C. §103(a) as being unpatentable over Wakabayashi et al. in view of Nishida (US 6,429,265), claims 20-24 were rejected under 35 U.S.C. §103(a) as being unpatentable over Lee (US 5,847,261), in view of Wakabayashi et al., claim 25 was rejected under 35 U.S.C. §103(a) as being unpatentable over Lee in view of Wakabayashi et al., as applied to claims 20-24 above, and further in view of Nishida, and claims 27-29 were rejected under 35 U.S.C. §103(a) as being unpatentable over Wakabayashi et al. These rejections are respectfully traversed.

With respect to dependent claims 5-14, 16-19, and 27-29, Applicants respectfully note that §103(a) rejections for these claims are rendered moot in light of the Examiner's reliance of Wakabayashi et al. As described above, Wakabayashi et al. does not disclose or suggest many of the elements recited in Applicants' claimed invention.

With respect to independent claim 20 and dependent claims 21-25, the Examiner cites Lee for disclosing a microwave oven aspect, and Wakabayashi et al. for disclosing a polymer-type humidity sensor element recited in the claim 20-25. Again, for at least the reasons stated above, Wakabayashi et al. does not disclose or suggest a polymer-type humidity sensor as recited in claims 20-25, and therefore, §103(a) rejections for these claims are also rendered moot.

Finally, while claims 5-14, 16-19, 21-25 and 27-29 are allowable at least due to their dependency on independent claims 1, 15, 20 and 26, Applicants have shown that many of the additional features recited in the dependent claims have not been disclosed or suggested by the cited references. For example, and in addition to the features recited in the dependent claims described above, Applicants note that an obviousness rejection with regards to claims 13 and 14 is inappropriate in light of the fact that Wakabayashi et al. discloses a thin film type humidity sensor.

That is, Wakabayashi et al., individually or as combined with other references, does not disclose or suggest that a humidity sensing film structure of Wakabayashi et al. can be modified into a cylindrical shape or a coil shape. In fact, it appears that Wakabayashi et al. expressly teaches away from such shapes as it states "that the thickness of the humidity sensitive film 1 is designed to be between 2 and 5 microns." While Wakabayashi et al. states that the thickness of the humidity sensitive film can be increased, it also states that such an

increase will result in deterioration of the sensing performance, for example, result in slower response to the changes of humidity. (See column 2, lines 2-10). Therefore, Applicants note that even assuming argumendo that a motivation to combine the cited references exists, a reasonable expectation of success to arrive at Applicants' claimed invention does not exist. In other words, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Applicants' disclosure. (See MPEP §§2142 – 2143 and In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)).

Thus, it is respectfully submitted that claims 5-14 and 16-19 are patentable under 35 U.S.C. §103(a) over Wakabayashi et al. in view of Nishida (US 6,429,265), claims 20-24 are paentable under 35 U.S.C. §103(a) over Lee (US 5,847,261), in view of Wakabayashi et al., claim 25 is patentable under 35 U.S.C. §103(a) over Lee in view of Wakabayashi et al., as applied to claims 20-24 above, and further in view of Nishida, and claims 27-29 are patentable under 35 U.S.C. §103(a) over Wakabayashi et al.

CONCLUSION:

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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